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Original Article

Is 1-Point Fixation at Zygomatic Buttress Adequate in Non-Comminuted Zygomatic Complex Fracture? A Prospective Comparative Study

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Abstract

zygomatic complex fractures generally require open reduction internal fixation through several approaches. The aim of this study was to compare 1-point fixation at zygomatic buttress area with 2-point fixation at frontozygomatic (FZ) and zygomatic buttress areas in non-comminuted zygomatic complex fractures. Ten patients (Group 1) were treated with 2-point fixation and other 10 patients (Group 2) were treated with 1-point fixation. Both the groups were postoperatively assessed for unfavorable scars, palpability of plates, bony movement in the FZ area, and satisfaction with surgical outcomes. Postoperatively, all patients had satisfactory approximation of fractured segments when evaluated radiographically at 1 week and 6 weeks interval in both the groups. All patients from Group 1 had complaint of palpability of plates at FZ region and four patients from Group 1 were unsatisfied with the scar. One-point fixation in the zygomatic buttress area can avoid unsightly scars, palpability of plate, and high satisfactory surgical outcomes in non-comminuted zygomatic fractures.

Key words: Zygomatic complex fractures, 1-point fixation, Zygomatic buttress, Tripod fracture

INTRODUCTION

Zygomaticomaxillary tripod fracture is relatively common and generally requires open reduction-internal fixation through several approaches. Conventionally, the fixation of zygomaticomaxillary complex (ZMC) fractures is done at 3 points – the zygomatic buttress, infraorbital rim, and the frontozygomatic (FZ) suture area. A number of surgeons have used 2 of the 3 points at zygomatic buttress and FZ suture area for fixation of the ZMC fractures and have reported satisfactory results. In this fixation method, there is a need for extraoral lateral eyebrow incision and that may leave unsightly scar, palpability of plates, and risk of penetration into anterior cranial fossa and swelling resulting from severed muscles and soft tissues as they are thin in FZ area. When plates are removed in case of infection, repeated lateral eyebrow incision may give more chances to leave external scar.

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However, 1-point fixation in ZM buttress region gives sufficient stability and can avoid external unsightly scars or palpability of plates or screws and give high satisfactory surgical outcome. In addition, when plates or screws are removed through intraoral vestibular approach and leave no external scars.[1-4]

MATERIALS AND METHODS

The study was approved by the Institutional Ethical Board and the consent was obtained from all the patients included in the study. Retrospective data of 10 patients with ZMC fractures treated by 2-point fixation between 2015 and 2017 were assigned as Group 1. Prospective patients with ZMC fractures from November 2017 to May 2019 (18 months) treated with 1-point fixation were assigned as Group 2 [Figure 1]. All cases with blowout fracture of the orbital floor, extraocular muscle entrapment or herniation of periorbital fat, and comminuted fracture were excluded from this study.

All patients were operated under general anesthesia to expose ZM buttress through intraoral approach and reduction was done by intraoral elevation. Reduction was

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Figure 1: Group-1: Patient treated with 2-point fixation at frontozygomatic suture and zygomatic buttress regions. 1. a – Pre-operative; 1. b – Intraoperative; 1. c – Post-operative

Figure 2: Group-2: Patient treated with 1-point fixation at zygomatic buttress region. 2. a – Pre-operative; 2. b – Intraoperative; 2. c – Post-operative

considered satisfactory when the gap at the fractured site/s was not more than 1 mm, malar projection was symmetrical when viewed from birds view and worms view, and the occlusion was stable. Fixation was achieved using suitable 2 mm (4 holed) titanium L-shaped plate and monocortical screws (2/6 mm) and then intraoral wounds were sutured [Figure 2].

RESULTS

All the patients included in the study underwent post-operative clinical, radiographic, and photographic evaluation at 1 week and 6 weeks interval.

All 20 patients had satisfactory approximation of fractured segments when evaluated radiographically at 1 week and 6 weeks interval. Five patients required post-operative IMF from Group 1 while none from Group 2. Five patients including two female patients were unsatisfied with the acceptability of scar at lateral eyebrow region at the end of 1 week. At the end of 6 weeks, four patients were unsatisfied with the scar. One patient from each group had the asymmetry of malar projection persisted for 6 weeks and the esthetics was considered unsatisfactory. All patients from Group 1 had the plates at the FZ suture palpable. In Group 1, enophthalmos was persistent in one patient till the end of 6 weeks with no other orbital complication.

One patient had wound dehiscence at the lateral eyebrow incision site at 1 week and secondary wound closure occurred by the end of 6 weeks.

DISCUSSION

The ZMC is an essential component of the facial configuration. Because of its location, it is subjected to trauma more often than any other element of the face except the nose. Although some injuries will involve an isolated orbital rim or antral wall fracture, most injuries will include the zygomatic bone and thus the term "zygomaticomaxillary." The consequences of such injuries may involve ocular function, orbital shape, facial esthetics, and mandibular mobility.[5]

ZMC fractures requiring open reduction and internal fixation (ORIF) are often treated through several approaches. Although different treatment modalities have been advocated for the management of ZMC fractures, at present, ORIF with non-compression plates is considered the standard of care. Few randomized prospective clinical studies have compared the stability of zygoma after 3-, 2-, and 1-point fixation with miniplates.

Fractured zygomatic segment has six possible directions of motion: Translation across x, y, and z axis; rotation about x, y, and z axis. A miniplate applied across the FZ suture will resist translatory movement and also rotation along an axis perpendicular to the plane of miniplate because of the width of the plate. At the same time, it will offer little resistance to rotation along the linear axis of the plate.[6,7] However, 1-point fixation in ZM buttress region gives sufficient stability and can avoid external unsightly scars or palpability of plates or screws, short surgical period and gives high satisfactory surgical outcome.[1,4,8-10]

Mean vertical change improved from 1.28° to 0.58° ($P < 0.001$), and the mean horizontal change improved from 1.71° to 0.92° ($P < 0.001$). Post-operative vertical movement of the zygoma was not significantly affected by communition of the inferior orbital wall, zygomaticofrontal process displacement, or comminution of the ZMB area and zygomatic arch ($P > 0.05$ for each). However, comminution of the ZMB area had an adverse effect on horizontal movement of the zygoma ($P = 0.03$).[4] Displacement at the fractured site of <2 mm at the end of 1 week and 6 weeks was considered satisfactory fixation.[11] One-point fixation at the ZMC gives 3-point alignment and sufficient rigidity when the fractures are not comminuted.[2,3,12-14] None of the patients complained of bony movement and pain in the FZ area with no fixation in the FZ area.[1] In our study, we found satisfactory fixation in all the patients.

Kim *et al.* in their study of 30 patients reported that 16 patients (53%) were unsatisfied with the scar at the lateral brow incision site. Unsightly scars are a serious problem because maxillofacial fractures occur mostly in young adults.[1,4]

In our study, the patients and the surgeon's perception of the scar at the end of 1 week and 6 weeks was evaluated. We had 4 patients (40%) who were unsatisfied with the scar at the FZ suture region at the end of 6 weeks in Group I. In the same patients, the surgeon found the scar to be satisfactory in nine patients and unsatisfactory in one patient. In Group II, no patients had complaints about visibility of scar.

In our study, we evaluated the malar projection both clinically and on photographic evaluation. Displacement of zygoma <2 mm in either anteroposterior or lateral direction was considered satisfactory. We had malar asymmetry in 1 patient (10%) in Group I treated with 2-point fixation and 1 patient (10%) in Group II treated with 1-point fixation.

In our study, palpability of the plates was evaluated clinically, we had 10 patients (100%) with palpability of plates at the FZ region in Group I and no patient (0%) had palpability of plates at the FZ region in Group II as closed reduction was carried out.

However, because the ZM buttress plays a key role in withstanding contraction of the masseter muscle and supporting zygoma, rigid fixation at the ZMB is important in the treatment of tripod fractures.

The advent of miniplate osteosynthesis revolutionized the treatment of ZMC fractures. Rigid internal fixation is the modality with the most reliable results. However, the surgical approaches to the fracture sites, the optimal time schedule for operation, and the number of sites for miniplate osteosynthesis are still a focus of debate. Stability and accuracy of the reduction are also debated with regard to the number of plates applied to the facial buttresses.

CONCLUSION

No definitive conclusions have been made evaluating the efficacy of 1-point fixation for the management of ZMC fractures. Hence, this study was designed to evaluate the efficacy of 1-point fixation for ZMC fractures and the results were compared with 2-point fixation in terms of stability of fixation, esthetic, orbital, and functional parameters, along with the evaluation of post-operative complications.

Surgeons should utilize 1-point fixation at ZM buttress in all cases of non-comminuted ZMC fractures to achieve equivalent results without an additional fixation site with its

associated complications, additional cost of hardware, and prolonged operative time. This technique allows sufficient stability, avoids external scar, and palpability of plates at FZ suture area and less invasive. The use of single miniplate in the management of isolated ZMC fractures is, therefore, quite justified as the advantages far outweigh the disadvantages. However, this fixation is not feasible in patients with (1) comminuted zygomatic fractures; (2) incomplete or unsatisfactory reduction through a buccogingival incision; and (3) fractures combined with orbital complications.

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